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THE following communications were read:—

I. Extract of a letter, dated March 24, 1831, from M. Cauchoix, of Paris, to the Rev. R. Sheepshanks:—

"I have just finished an object-glass larger than that of Sir J. South. Two satisfactory trials of it were made on the 17th and 22nd of March, by Messrs. Bouvard, Arago, Mathieu, and Gambard, on the trapezium of *Orion*, *Venus*, a difficult double star, and *Saturn*, with magnifying powers of from 200 to 1000; and though the sky was covered with light whitish clouds, the images were distinct and brilliant, without any colour or scattered light. I subjoin the exact measures of the object-glass, and the various magnifying powers employed up to the present time. M. Gambard, who has made more observations with this telescope than any other person, thinks that stronger eye-glasses may be easily adapted to it.

	Old French feet.			Metres.	English feet.	
	f.	*i.*	*l.*		*f.*	*i.*
Diameter of the convex lens.....	1	1	1·0	0·354	1	1·86
———— concave flint-glass	1	0	7·0	0·341	1	1·50
———— real aperture	1	0	4·5	0·335	1	1·29
Focus of the object-glass	23	7	5·0	7·700	25	3·00

Powers employed ..... 201, 324, 397, 461, 786, and 1000.

"These powers are not exaggerated, but have been measured with scrupulous care; so that you may be assured no future trial will give them less than the numbers here quoted."

II. A communication from the Astronomer Royal, containing the results of all the observations, which have been made at the Royal Observatory at Greenwich, of the sun's zenith distance, at or near the solstices, from the time of Bradley to the present time.

The number of observations is given; from which it appears, that, during the time of Bradley, there were 74 such observations of 7 summer solstices, and 61 observations of 7 winter solstices: during the time of Maskelyne, 317 observations of 32 summer solstices, and 220 observations of 31 winter solstices; and by the

present Astronomer Royal, 1560 observations of 19 summer solstices, and 882 observations of 17 winter solstices.

By taking the mean of the seven determinations of the summer solsticial zenith distances by Bradley, and also the mean of his seven determinations of the winter solsticial zenith distances, in seven successive years, beginning with the winter solstice of 1753, and comparing these values respectively with the values of the same elements, as deduced by taking the mean of the six last determinations of the summer solsticial zenith distances, and the mean of the five last determinations of the winter solsticial zenith distances, by Mr. Pond, the annual variation is found to be 0″,41455. By a similar mode of proceeding with the winter solstices, he finds the annual variation to be 0″,4787.

Mr. Pond then proceeds to direct the attention of astronomers to the difference in the values of the latitude of the Royal Observatory, as obtained from Bradley's solsticial zenith distances, and as derived from the solsticial zenith distances, deduced from his own observations within the last six years. He states the latitude, which results from Bradley's observations, to be 51° 28′ 40″,323; and that which is obtained from his own observations to be 51° 28′ 38″,077; the difference being 2″,256.

III. A communication from Sir Thomas Brisbane, consisting of observations of the moon, and moon-culminating stars, during the years 1829 and 1830, made at Makerstoun with a four-feet transit. Sir Thomas Brisbane states in the letter accompanying his paper, that "the observations were almost entirely made by Mr. Dunlop." The paper contains the observed differences in A.R. between the moon and the moon-culminating stars, observed before and after her culmination, and also the number of wires used in each observation.

IV. On the theory of the eye-glasses of telescopes; by Professor Littrow, Associate of the Society.

The author begins by taking the case of an eye-glass composed of any number of lenses placed at any distance from one another. He then deduces simple expressions for the magnifying power, the field of view, and the distance at which the eye should be placed, as also the equations which must be satisfied in order that the spherical and chromatic aberrations may be inconsiderable.

He then describes the manner of conducting the process, which he proceeds to apply to the eye-glasses in common use, namely, of one, two, and four lenses, in the following order:—

1. The common astronomical telescope, and the Galilean, or, as he calls it, the Dutch telescope. He here shews that the chromatic aberration cannot be destroyed, and other well-known defects of these constructions.

2. When the eye-glass has two convex lenses. Though in this telescope, a wire micrometer cannot be used, on account of its being requisite to place it between the lenses of the eye-glass, yet,

being perfectly achromatic, it has been used by Dollond, Ramsden, and Fraunhofer, for night telescopes or sweepers. The construction used by these artists is shewn from this theory to be the best for giving a large field of view.

3. Ramsden's telescope, with a convex and concave lens in the eye-glass. The theory of this instrument, which can be used with a wire micrometer, but cannot be freed from chromatic aberration, was imperfectly given by Ramsden in the *Philosophical Transactions* for 1783, p. 94, and is here deduced from the general equations, the results agreeing very nearly with those of Fraunhofer.

4. The common terrestrial telescopes, with four lenses in the eye-piece. Here results are deduced which have not been used by English or German artists, but, at the same time, it is shewn that those which have been used are consistent with the theory.

V. The reading of a paper by Francis Baily, Esq., on Lacaille's catalogue of 398 principal stars, was begun. The abstract of this paper will appear in the next Monthly Notice.

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